National Science Foundation
Directorate for Biological Sciences
Division of Integrative Organismal Biology

November 2004

Dear Colleague:

In the Directorate for Biological Sciences (BIO), the reorganization of the Division of Integrative Biology and Neurosciences (IBN) into the Division of Integrative Organismal Biology (IOB) was effective July 26, 2004. The purpose of this letter is to explain the rationale for the reorganization and describe the areas of science that will be supported by IOB.

Rationale. IBN was reorganized into IOB to emphasize the biology of organisms, the fundamental units of life. The intent is to foster research on biological processes in plants, animals, and microbes. This reorganization is meant to stimulate exploration of the biology of organisms and to encourage close intellectual linkages with the other Divisions in BIO (Environmental Biology, Molecular and Cellular Biology, and Biological Infrastructure) and increase the potential for networking both inside and outside the NSF.

IOB Scientific Emphasis. IOB will support research aimed at understanding organisms as units of biological organization, with particular emphasis on their behavior, development, function, and responses to environmental stimuli. An underlying theme in IOB is the use of a wide diversity of organisms to identify unifying principles and to understand evolutionary mechanisms. Understanding behavior, development, function, and responses to environmental stimuli requires integrative approaches, including analysis from the molecular through the ecosystem levels. In addition, IOB is seeking to support projects that employ advanced computational techniques and interdisciplinary approaches involving other areas of biology, behavioral science, physical science, mathematics, engineering, and computer science. Multidisciplinary, collaborative research projects are encouraged.

IOB Organization. IOB is organized into four clusters: behavioral systems, developmental systems, environmental and structural systems, and functional and regulatory systems.

The **BEHAVIORAL SYSTEMS** cluster focuses on the development, function, mechanisms, and evolution of behavior, biological rhythms, and interactions between organisms including animals, plants, and microbes. This cluster supports research on social and reproductive behavior; behavioral ecology and physiology; neural and hormonal mechanisms of behavior; immunology of behavior; and the biological bases of learning, cognition, and communication. Behavioral Systems also encompasses physiological responses, chemical communication, and reproductive consequences of plant interactions with other organisms. The use of functional genomic approaches in projects that seek to understand physiological and behavioral adaptations to environmental stimuli and stress is encouraged.

Program Directors:

- Diane Witt. *Neural mechanisms underlying behavior and neuroendocrine regulation of brain-behavior relationships, including reproductive/social behavior, learning and memory, and biological rhythms in animals*
- Godfrey Bourne. *Behavioral ecology of animals and plants; evolution of parental care; sexual selection, including reproductive behavior and behavioral adaptations to environmental stimuli and stress*
- Jerry Wolff. *Behavioral ecology, mating systems, sexual selection and social evolution, learning and cognition*
- Gary Thompson. *Plant-biotic interactions, including molecular and physiological responses to pathogens and non-pathogenic organisms*

The **DEVELOPMENTAL SYSTEMS** cluster focuses on the nature, control, and evolution of those processes that comprise the life cycle of organisms. Research on the mechanisms of gametogenesis, fertilization, embryogenesis, differentiation, pattern formation, and morphogenesis, including research on the development, regeneration, and aging of the nervous system is supported. Genomic approaches, gene networks, integration of developmental gene pathways, and computational approaches are included. Studies that explore the evolution of developmental mechanisms are encouraged.

Program Directors:

- Judith Plesset. *Animal development, including evolution of developmental mechanisms*
- Susan Lolle. *Plant & microbial development, including evolution of developmental mechanisms*
- Marc Servetnick. *Neural development*

The **ENVIRONMENTAL & STRUCTURAL SYSTEMS** cluster focuses on the function and evolution of organisms in their physiochemical and biotic environments. Included are studies of physiological ecology, functional morphology, animal sensation and movement, molecular bases of tissue biomechanical properties, and environmental genomics. Proposals that include computational or engineering approaches in any of these areas of biology are encouraged.

Program Directors:

- William Winner. *Ecological and evolutionary physiology of plants and microbes*
- William Zamer. *Ecological and evolutionary physiology of animals*
- Cole Gilbert. *Function and evolution of sensory input, including evolution of animal sensation and movement; functional morphology; sensorimotor mechanisms*

The **FUNCTIONAL & REGULATORY SYSTEMS** cluster focuses on fundamental physiological mechanisms and how they have evolved, with emphasis on organisms as integrated systems. This area includes comparative physiology, neurophysiology, mechanisms of solute transport, and comparative or evolutionary immunology. It includes research at the genetic, genomic, cellular, tissue, organ, system, and organismal levels of organization. Also supported are studies of neuronal and glial cell function and synaptic mechanisms as they relate to integrated organismal systems. Proposals for computational modeling to further understanding of physiological processes in organisms are encouraged.

Program Directors:

- Steve Rodermel. *Plant physiology and molecular biology, including metabolism and mechanisms of response to abiotic factors and growth regulators*
- Ione Hunt von Herbing. *Comparative animal physiology, including immunology, endocrinology, and physiological energetics*
- Thomas Vandergon. *Evolutionary and molecular animal physiology and metabolism*

Sincerely,

Thomas Brady
Division Director

Judith Verbeke
Deputy Division Director

Integrative Organismal Biology